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THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

John Joseph Konrad et al.

Serial No.: 09/804,921 : Art Unit: 2811

Filed: March 13, 2001 : Examiner: Vu, Quynh Nhu H

For: STRUCTURE HAVING
LASER ABLATED
FEATURES AND METHOD
OF FABRICATING : Atty Docket: END9-2000-0077US1

RESPONSE TO OFFICE ACTION UNDER 37 CFR 1.111

Commissioner for Patents
Washington, D.C. 20231

Sir:

This is in response to the office action dated January 30, 2002.

In the claims:

Please amend claim 1 as follows:

1. (Amended) An electronic structure comprising:

a first dielectric layer of polymeric material having a first top surface;
a second dielectric layer of polymeric material on said first top surface of said first
dielectric layer of polymeric material, having a second top surface, said second layer of
polymeric material also having trench features therein; and electrically conductive
material deposited in said trench features forming electrically conductive circuit lines
being substantially flush with said second top surface of said second dielectric layer of
polymeric material, wherein said polymeric material is at least one member selected
from the group consisting of thermoplastic resin and thermosetting resin.

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Remarks

Claims 1-31 are now in the application. Claims 1-10 are directed to the directed invention. Claims 11-31 are drawn to a non-elected invention identified by the Examiner as Group II and may be canceled by the Examiner upon the allowance of the claims directed to the elected invention. Claim 1 has been amended for purposes of clarity in reciting that the polymeric material is at least one member selected from the group consisting of thermoplastic resin and thermosetting resin.

Claims 1-4 and 10 were rejected under 35 USC 102(e) as being by U.S. Patent 6,335,077 to Tani et al.(herein after as referred to as "Tani"). Tani fails to anticipate the present invention.

The present invention provides for obtaining a structure having dense embedded flush circuitry features. The present invention makes it possible to create circuitry features that are much more densely configured than those fabricated using current methods. This is made possible since the final structure is a circuitry feature having dielectric regions and conductive features that are coplanar.

In particular, the present invention relates to a structure comprising a first dielectric layer of a polymeric material having a first top surface; a second dielectric layer of polymeric material on the first top surface of the first dielectric layer of a polymeric material, having a second top surface, the second layer of polymeric material also having trench features therein; electrically conductive material deposited in said trench features forming electrically conductive circuit lines and being substantially flush with the second top surface of the second dielectric layer of polymeric material.

The present invention is especially advantageous for fabricating buried interconnection levels that are in close proximity to one another in a printed circuit board structure.

As discussed in the specification, printed circuit board interconnection levels prior to the present invention are built on top of a dielectric thin film layer. Circuitry features are formed using photolithographic and subtractive etch techniques. In a typical method, a metallic foil and especially copper foil is laminated to the substrate followed by using photolithographic and subtractive etching to create the circuitry. The copper foil includes a roughened or dendritic backside surface for inducing mechanical adhesion to the substrate. Smooth copper layers do not adequately bond without an auxiliary bonding agent.

Great difficulties exist in adequately etching dendrites especially when dealing with small spaces. Moreover, along with the concern created by dendrites, the width of the lines (e.g. about 0.5 mils wide), and photolithographic issues (e.g. resolution of fine features, 0.7 mil wire with 1.1 mil space, in a thin photo resist film), and subtractive etch undercut/pad rounding, render clearly and fully resolving small line spaces such as the 1.8 mil pitch features presently desired very difficult. Additionally, this subtractive etch approach results in unprotected circuitry features referred to as "skyscrapers" that extend above an underlying plane of dielectric barrier material.

In many structures, it is important to plate another metal such as gold or nickel-gold onto the copper circuitry. The "skyscraper" structure causes a problem of bridging or shorting between lines especially where there exist closely spaced fingers.

As discussed in the specification, the present invention addresses these concerns of the prior art.

US patent 6,335077 to Tani et al. does not anticipate the present invention since, among other things, such fails to even remotely suggest dielectric layers of polymeric materials, e.g thermoplastic or thermosetting resins. Instead, Tani relates exclusively to ceramic substrates and the use of pastes to fill vias. For instance, see column 1, lines 48, 61 and 63; column 2, lines 1, 4, 5, 11, 17, 19, 21, 36, 38, 39, 44 and 58; column 3, line 57 et seq. and column 4, line 57 to column 5, line 15. The organic carriers or binders referred to by

Tani are for the purpose of forming the conductive paste or the raw slurry for fabricating the ceramic. However, during the firing of the ceramic structure, the organic carriers or binders will be burned away as readily appreciated by those skilled in the art.

Since Tani does not disclose dielectric layers of polymeric materials, Tani does not anticipate the present invention.

In particular, anticipation requires the disclosure, in a prior art reference, of each and every recitation as set forth in the claims. See *Titanium Metals Corp. v. Banner*, 227 USPQ 773 (Fed. Cir. 1985), *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 1 USPQ2d 1081 (Fed. Cir. 1986), and *Akzo N.V. v. U.S. International Trade Commissioner*, 1 USPQ2d 1241 (Fed. Cir. 1986).

There must be no difference between the claimed invention and reference disclosure for an anticipation rejection under 35 USC 102. See *Scripps Clinic and Research Foundation v. Genentech, Inc.*, 18 USPQ2d 1001 (CAFC 1991) and *Studiengesellschaft Kohle GmbH v. Dart Industries*, 220 USPQ 841 (CAFC 1984).

Claims 5 and 6 were rejected under 35 USC 103(a) as being unpatentable over Tani et al in view of U.S. Patent 6,183,669 to Kubota et al.(hereinafter also referred to as "Kubota"). Kubota does not overcome the above discussed deficiencies of Tani. Kubota relates to pastes that can be screened to form vias or conductors in ceramic substrates. relates exclusively to ceramic substrates and the use of pastes that can be screened to form vias or conductors in the ceramic substrates. The organic carriers or binders referred to by Tani are for the purpose of forming the conductive paste or the raw slurry for fabricating the ceramic. However, during the firing of the ceramic structure, the organic carriers or binders will be burned away as readily appreciated by those skilled in the art.

Accordingly, claims 5 and 6 are patentable for at least those reasons as to why claim 1 is patentable.

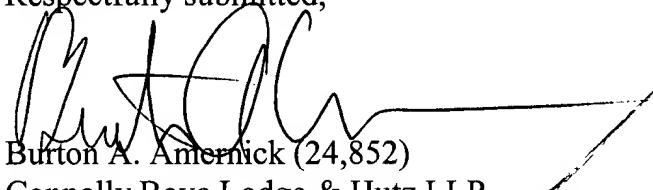
Claims 7-9 were rejected under 35 USC 103(a) as being unpatentable over Tani et al. Tani does not render obvious claims 7-9 since, among other things as discussed above, Tani fails to even remotely suggest dielectric layers of polymeric materials as employed according to the present invention.

In view of the above, consideration and allowance are, therefore, respectfully solicited.

In the event the Examiner believes an interview might serve to advance the prosecution of this application in any way, the undersigned attorney is available at the telephone number noted below.

The Director is hereby authorized to charge any fees, or credit any overpayment, associated with this communication, including any extension fees, to Deposit Account No. 22-0185.

Respectfully submitted,


Burton A. Amernick (24,852)
Connolly Bove Lodge & Hutz LLP
1990 M Street, N.W.
Washington, D.C. 20036-3425
Telephone: 202-331-7111

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